unimportant manner . . . by the direct action of external conditions . . ." This passage is considered by Osborn to prove that the progressive tendency towards the explanations of Lamarck and Buffon which he believes Darwin exhibited from 1859 onwards—culminated at the close of his life. But the sixth edition appeared in 1872, and the date 1880 is merely that of a reprint. The words in question were certainly written before the former date, and even in the fifth edition (1869) Darwin inserted the word "chiefly" to qualify an expression of confidence which might have been interpreted as a belief in the all-sufficiency of natural selection.

The fact appears to be that there was no progressive change in Darwin's attitude on this subject, but that his opinion fluctuated as various classes of evidence were brought before him, and at the very end of his life his belief in the direct action of external conditions was seriously shaken by the results of Hoffmann's experiments. The effect produced on him is well shown in his letter to Semper, written July 19, 1881, less than a year before his death ("Life and Letters," vol. iii.). But although Darwin's opinion fluctuated as to the relative value of the supposed causes of evolution other than natural selection, his views as to the paramount importance of the latter never varied in any of his published utterances. The words which conclude the Introduction of the 1859 "Origin" are repeated without change in each succeeding edition and reprint. "Furthermore, I am convinced that natural selection has been the main, but not the exclusive means of modification."

The printing and general get-up of this interesting work leaves nothing to be desired, being far above the average that obtains in scientific publications. It may confidently be predicted that the book will be widely read and greatly appreciated. E. B. P.

## THE ELEMENTS OF ARCHITECTURE.

*Architecture for General Readers, &c.* By H. Heathcote Statham. 8vo. (London: Chapman and Hall, 1895.)

THE aim of this treatise, as stated in the preface, is certainly a good one, namely, to supply the "general reader" with the means of criticising architecture in an intelligent manner, and principally by giving an analysis of the two most logical and complete styles that have ever existed, namely, the Greek and the Gothic; the former representing the trabeated, and the latter the arcuate system of building. Our author, however, very properly does not confine his attention to these two styles and their later developments, but also makes wide digressions in the direction of Egyptian, Byzantine, and Mahommedan structures, all of them being copiously illustrated and discussed at considerable length. The work exhibits throughout the author's great and varied acquaintance with his subject, and cannot but be of much interest and value to any reader who desires to dive more deeply than amateurs are accustomed to do into the principles which ought to guide the professional architect, and which, indeed, do guide all those who achieve anything worthy of the art in which they practise.

In page 20 the importance of planning is properly insisted on. The plan is shown to be the very "backbone" of the structure, and the attention of the "general reader" is rightly called to this. It may be doubted, however, whether the general reader is prepared for the minute criticism, which we find a little further on, respecting certain competition designs, which criticism is rendered the more difficult to follow, in consequence of the small scale of the plans by which these designs are illustrated, and he may, perhaps, wish that he had been led into such deep water more gently. In page 31, with reference to the proportions of buildings as affecting the eye, the author appears to doubt whether—with the exception of the late Mr. W. W. Lloyd's discovery of the system which prevails in the Parthenon—any definite and clear case has been made out for the establishment of proportion theories. The author is probably quite justified in his refusal to accept any general adoption of a system for proportioning buildings "on the basis of geometrical figures, especially triangles of various angles." There could not possibly be any æsthetic value in confining the main lines of the architecture within such limits; but rectangular proportions in low numbers (of which nature are the proportions of the Parthenon) are on a different footing, and it is extremely probable that they do produce harmonious effects. They are to be found in many other Greek examples besides the Parthenon, and in one Gothic building at least, namely, the work of Bishop Grosetete in the nave of Lincoln Cathedral (see the *Transactions* of the Archæological Institute of Great Britain, &c., for 1848), where rectangular proportions of this character come out without any "coaxing" with remarkable exactness; and as Bishop Grosetete, besides being a great ecclesiastic, was one of the most prominent philosophers of his day, there is the more reason to accept it as having been intentional.

In p. 34, the chief characteristics of the Egyptian, the Greek and the Gothic are summed up in a few words, as Mystery, Rationalism, and Aspiration. In p. 43, the meed of merited praise is given to Mr. E. L. Garbett's excellent little treatise on "The Principles of Design in Architecture." In p. 58, doubt is thrown on the wooden origin of the Greek entablature. The reader, however, may be referred to MM. Perrot and Chipiez' recent work on "The Arts of Primitive Greece," in which this derivation is shown from the remains at Tiryns, Mycenæ, and Orchomenus. In p. 73, the Corinthian example of the temple of Jupiter Olympius at Athens should not be attributed to a Roman source; it dates from Antiochus Epiphanes, the Greek founder, and the prototype of the capital is found in the *tholos* at Epidaurus, a pure Greek building. No doubt at the time the Athenian temple was built, about 170 B.C., Rome was pushing her way towards the East, and Antiochus himself had been sent as a hostage to Rome after the defeat of his father by Scipio. There may have been something political in his employment, as we are told of a Roman citizen as his architect, but the architecture itself, at that date, could not but have been thoroughly Greek.

In p. 78, the author well illustrates his argument, showing the superiority of constructive simplicity in a design over another decorated with meaningless architectural detail, by the contrast of London and Blackfriars Bridges; but it is not so clear, as maintained in the previous page that the combination of columnar and arcuate design in the same wall is a "Roman sham." It is no doubt a

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departure from primitive simplicity, but there seems no reason for calling it a sham, in cases where both types are used constructively. The "general reader" may certainly be justified in passing over the "approximate theory" of the strains of arches, but the subject of pendentives (in p. 95) is more to the point, having very important relation to the construction of cupolas. Much more seems to be made in the criticism on the shams of St. Paul's (p. 98) than the subject warrants. The design is blamed because the interior cupola is distinct from the external. There would be as much reason to blame the magnificent central towers of some of our cathedrals because the open lantern chamber over the crossing does not rise to the summit of the tower or spire. The author, however, duly praises Sir Christopher Wren's first design, the Greek cross plan, of which a good judge, the late Rev. J. L. Petit, has maintained that if this design had been executed it would have been the finest interior in the world. On the subject of vaulting (pp. 107-116), the development of which is well and clearly followed out, it is stated that the pointed arch was *invented* for the purpose of facilitating the construction. This could hardly have been the case, because the pointed arch had been used in the East long before the period referred to; but its great applicability to that favourite architectural feature was then recognised, and when once introduced for constructive reasons, it soon began to influence the whole structure.

In p. 125 commences a chapter on the theory and use of mouldings, which play so important a part in architectural design that it is quite essential that an amateur who desires to form a right judgment on architectural subjects, either historically or critically, should study their development and application; he will find the subject clearly and logically explained in this chapter. In chapter v. are some judicious remarks on ornament, showing on the one hand that however valuable a help it may be, the art is really independent both of sculpture and carved ornament, and that the latter is inferior in expression to mouldings properly used. In pp. 184-188 are some just views on the combination of architecture with scenery. Without going so far as to say that a spire on a hill—such, for instance, as Harrow—must necessarily be ill-placed, the statement of the incongruity of this feature in a mountainous country may be supported by citing the example of incongruous effect of the Ambleside spire in a Westmoreland valley.

The work ends with an historical sketch, which shows much thought and learning. The author can, however, scarcely be correct in speaking of such structures as the Treasury of Atreus at Mycenæ as formed of large blocks of masonry with no architectural details whatever. It is possible that the ornate elaboration of the Beehive tombs at Mycenæ and Orchomenus, as shown in Perrot and Chipiez' work, before referred to, may be a good deal exaggerated; but there certainly exists evidence for a very considerable amount of architectural embellishment. In speaking of the derivation of the Corinthian capital, it seems unnecessary, with the small amount of evidence to the contrary which exists, to relegate to the regions of fable the touching little story told by Vitruvius (chapter iv. p. 1) of its invention by Callimachus, especially as the earliest known example, in the temple at Bassæ, was the work of a contemporary, and probably a friend of the reputed inventor.

In p. 255 the very important derivation of the dome is traced from the Pantheon, of which the date (in the reign of Hadrian) has lately been established, and then the addition of the spherical pendentive by Justinian's architect (Anthemius of Tralles) in the great church of St. Sophia. To this is added the derivation of the architecture of the Western churches—which is traced—following Prof. Baldwin Brown ("from the Schola to Cathedral"); from the Roman house, of which the atrium and peristylium became the forecourt or parvis and the porch, whilst the basilica supplied the apse, and the widening of the basilica on each side of the tribunal gave the germ of the transepts of our cathedrals. In the summary of the different contributions made by the European nations to Gothic architecture, Italy is denied altogether a specimen of true Gothic—and yet it possesses in Milan Cathedral an interior perhaps more impressive than that of any other church.

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## *"PARTURIUNT MONTES."*

*The Story of the Plants.* By Grant Allen. (London: George Newnes, Limited, 1895.)

MR. GRANT ALLEN tells the story of plants in a readable and very inaccurate manner. The keynote to his work is struck in his preface, in which he informs his reader that he has "wasted comparatively little space on mere structural detail," and, later on, that he makes "trivial sacrifices of formal accuracy" in order to expound general biological relationships. It is true that he apologises for these amiable little weaknesses, but adds, in the same breath, that he lays before his "untechnical readers all the latest results of the most advanced botanical research." It is impossible to avoid giving some samples of these "latest results."

For Mr. Grant Allen, the plant is essentially the *green* plant, and the essential function of this plant is constructive metabolism. On the other hand the animal is the very opposite of this, "he is a destroyer, as the plant is a builder." But we fancy most people will hardly admit this antithesis nowadays. Plants and animals both exist by breaking down complex bodies to simple ones, but plants as a whole can get the energy required for first building up these complex bodies at a less expensive outlay than animals, and the green plants, as Mr. Allen perfectly correctly observes, are further able to make use of sources of energy (*i.e.* vibrations of ether) from which their less fortunate relatives are debarred. But to draw the distinction just quoted as the *essential* difference between the two kingdoms, is obviously misleading. However, Mr. Allen is at least consistent in his views, since he states that the first plants "must have been green."

In the account given of the *modus operandi* of the building up of organic matter in the plant, the author's claims to up-to-date knowledge will, we fear, hardly be admitted. Chlorophyll is said to be the active agent in splitting up (under the influence of sunlight) the carbon dioxide and water to form starch. Now every student knows that chlorophyll can do no such thing, and further he knows, or should know, that starch is certainly not a primary product of assimilation. The latter, perhaps,

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